

**ECONOMIC DEVELOPMENT AT THE PORT OF BRUNSWICK:
AN ANALYSIS OF THE IMPACT OF INFRASTRUCTURE
IMPROVEMENTS**

A Thesis
Presented to
The Academic Faculty

by

Ashley Caron Rivera

In Partial Fulfillment
of the Requirements for the Degree
Master's of City and Regional Planning in the
School of City and Regional Planning

Georgia Institute of Technology
May 2010

**ECONOMIC DEVELOPMENT AT THE PORT OF BRUNSWICK:
AN ANALYSIS OF THE IMPACT OF INFRASTRUCTURE
IMPROVEMENTS**

Approved by:

Dr. David Sawicki, Advisor
School of City and Regional Planning
Georgia Institute of Technology

Dr. Jennifer J. Clark
School of Public Policy
Georgia Institute of Technology

Dr. Bruce Stiftel
School of City and Regional Planning
Georgia Institute of Technology

Date Approved: April 1, 2010

ACKNOWLEDGEMENTS

I would like to thank the managers of the Georgia Innovative Economic Development Internship Program, Jan Youtie and Robert Lann, under whose supervision this research began, as well as the program's sponsors, the Enterprise Innovation Institute, the School of Public Policy at Georgia Tech and Georgia Power, for supporting the program that made this research possible. I would also like to thank Dr. David Sawicki, Dr. Jennifer Clark and Dr. Bruce Stiftel for their feedback and assistance in developing this work into a thesis.

The industry experts who made themselves available for personal interviews and phone correspondence were an indispensable part of this research. A special thanks to Bill Dawson, Manager of Operations of the Port of Brunswick, the Georgia Ports Authority staff at the Port of Brunswick, T.J. Norvell, Director of Business Development at International Auto Processing on Colonel's Island, and Nathan Sparks, Executive Director of the Brunswick and Glynn County Development Authority.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
LIST OF TABLES	v
LIST OF FIGURES	vi
SUMMARY	vii
 <u>CHAPTER</u>	
1 Introduction	1
Purpose	2
Ports and Local Economic Development	3
Ports and Regional Competition	5
Measuring the Economic Impact of Port Activity	6
2 The Port of Brunswick	10
Industries at the Port of Brunswick	10
The Ports' Impact on Georgia's Economy	12
3 Infrastructure Improvements at the Port of Brunswick	15
4 Findings: The Impact of Infrastructure Improvements	19
Operational Impact	19
Economic Impact	25
5 Conclusions	30
APPENDIX A: Glossary of Technical Terms	34
REFERENCES	37

LIST OF TABLES

	Page
Table 1: Port of Brunswick Cargo Volume History	12
Table 2: Summary of Infrastructure Projects	16
Table 3: Operational Impact of Infrastructure Projects	24
Table 4: The Economic Impact of New Auto Cargo Volume in 2006 dollars	28
Table 5: The Economic Impact of New Agribulk Cargo Volume in 2006 dollars	29

LIST OF FIGURES

	Page
Figure 1: Estimated Cargo Values via Georgia's Deepwater Ports in FY 2007	14

SUMMARY

Between 1999 and 2007, a series of infrastructure improvements were completed at the Port of Brunswick, Georgia, in order to increase cargo capacity at the port. This paper looks at the port for indications of economic development generated through this infrastructure investment. Infrastructure improvements impact Georgia's economy by making additional cargo throughput possible through the Port of Brunswick by enabling larger cargo vessels to access the port. Additional cargo traffic generates economic opportunity by creating jobs to handle, move, sell and produce this new cargo volume. This analysis investigates what the infrastructure improvements accomplished in terms of improved port operations, what measurable impact they have had on throughput at the port, and associates these changes with economic gains for the State of Georgia.

Primary research is used to determine exactly what infrastructure projects were undertaken and how each impacted the port in terms of operations, actual new business and potential growth. This data on increased cargo volumes, realized and potential, is translated into statewide economic impact through existing data on how port traffic affects economic indicators such as output, gross state product, income and employment.

The infrastructure improvements created measureable gains at the Port of Brunswick in terms of increased cargo volumes and new business contracts. The effect through the State of Georgia is much greater when economic multipliers are considered.

CHAPTER 1

INTRODUCTION

Ports have long been important to regional economies, moving goods, people and military forces around the world. Typically located in large cities, ports have historically been the gate through which a city and the surrounding region engage in international and inter-regional trade. Because water transportation has historically been a faster, less costly mode of transportation than ground or air transportation, ports played a central role in the vitality of regional economies. In addition to providing access to world markets, ports and the businesses associated with port operations were a source of employment and economic activity in the local community.

Today, water transportation remains a cost effective method of moving goods around the world and ports retain their vital role in the global economy. The American Association of Ports Authorities reports as of 2010 that U.S. ports and waterways handle more than 2 billion tons of domestic and import/export cargo annually. As global trade grows, demand for international shipping and port capacity is growing as well. By 2020, the total volume of cargo shipped by water is expected to be double that of 2001 volumes (American Association of Port Authorities, 2010).

Growth in the global economy was fueled in large part by containerization – an innovation in shipping whereby goods are packed into standardized containers that can be loaded directly from truck to rail to ship. Container shipping was developed in 1957, and became the standard method of shipping pre-packaged products. Currently, more than 50% of the world's trade moves via containers. Non-containerized cargoes include liquid

bulk (i.e. crude oil), dry bulk (i.e. grains), rolling cargo (i.e. vehicles and machinery, also known as ro/ro for roll on/roll off), and break bulk (i.e. goods not in any of the above categories that do not fit well into containers). Containerization has both greatly expedited the speed at which cargo is moved from origin to destination and lowered shipping costs (Helling and Poister, 2000).

The development of container shipping has also impacted how US ports have developed since the 1960's. With more than 50% of the world's goods traded via containers, containerized cargo has become an important revenue source for US ports. Each type of cargo, liquid bulk, dry bulk, ro/ro, breakbulk and containers, has unique dockside infrastructure necessary to load, unload and store that particular type of cargo. For example, dry bulk requires special machinery to scoop or pump the dry grain between grain cars and the hold of a bulk ship. Containers require tall gantry cranes capable of lifting many tons.

Purpose

This thesis seeks to add to the literature on ports and economic development by analyzing a set of infrastructure improvement projects undertaken at the Port of Brunswick for their potential impact on the regional economy – in this case the economy of the State of Georgia. The State of Georgia is chosen as the unit of analysis because the Port of Brunswick is operated by the Georgia Ports Authority (GPA), a state funded agency that operates all of the state's port facilities and whose directors are appointed by Georgia's governor. As such, investment decisions made by the GPA are funded by and intended for the benefit of the entire state.

This analysis begins with a summary of the research literature regarding ports and economic development, which is followed by an overview of the Port of Brunswick and the types of cargo handled at the port. The details of a series of infrastructure projects completed at the port between 1999 and 2007 are presented, including harbor, channel and berth deepening, rail and road access improvements, and replacement of a narrow lift bridge with a wide span bridge. The impact of the infrastructure projects on Georgia's economy in the years since all projects were completed is then determined using a two-part approach. First, interviews with operations personnel at the Port of Brunswick provide information on how the infrastructure changes affect day-to-day operations at the port and what new business was realized as a result of the projects in the years after all projects were completed (2008-2010). Second, the increase in volume that can be attributed to the infrastructure projects is associated with existing data on the impact of cargo throughput at the ports on economic activity in the state in the form of employment, incomes, output and sales (Humphreys, 2007). This thesis concludes with a summary of the economic impact of this particular example of port infrastructure investment and a broader discussion of when public investment in port infrastructure is likely to be an efficient generator of economic development.

Ports and Local Economic Development

While ports are important to the modern global economy, their role in generating local economic development is less clear. A port provides local employment opportunities in two ways – on-site at the port through the managing Ports Authority, and at private businesses that locate on or near the port to provide port-related services (Helling and Poister, 2000). Port-related job opportunities include those related to cargo

processing, management of port operations and facilities, and jobs in inland transportation and distribution.

Investment in port infrastructure is typically done with state funding by a public ports authority that owns and manages port operations in the state. This raises questions of how much local economic benefit is realized by this public expenditure.

Transportation developments since the 1960's have facilitated growth in global trade but reduced the likelihood that port-related jobs will be located in the community in which the port is located (Helling and Poister, 2000; Cohen and Monaco, 2008).

Containerization has reduced labor needs at port facilities by allowing cargo to move directly from ship to truck to rail without the need to break apart or repack loads. The expansive interstate highway system in the US has reduced over-land transportation costs and widened the market that a port serves, encouraging port-related activity such as distribution and warehousing facilities – and therefore jobs – to locate further from the port where land and labor costs may be lower.

In a study of the ports used to accommodate US imports and exports, Godwin (as cited by Cohen and Monaco, 2008) found that the typical state relies on 14 ports on average to accommodate its imports and exports, the majority of which are external to the state. This underscores the broad geographic impact of any given port operation and indicates that public investment in a port facility facilitates economic activity beyond the borders of the state making the investment.

Ports and Regional Competition

The economic development gains from port infrastructure investment are further muddled by competition between ports that place the investment one state is making in its port against those of another state.

Ports remain competitive by demonstrating their capacity to handle large cargo loads. As shipping companies increase the size of ocean-going vessels to take advantage of economies of scale, they put pressure on ports to respond with infrastructure improvements to accommodate larger ships and cargo loads. In order to maintain contracts with the largest steamship companies, ports have been racing to develop 'hub' capacity (Helling and Poister, 2000). Potential hub ports are those with the capacity to handle the largest ships from the largest cargo carriers. The ability for shipping and manufacturing companies to use hubs for imports or exports reduces their transportation costs by allowing them to make fewer port calls. The implication for ports is that those who are unable to expand may become obsolete, and those who do not achieve sufficient scale may find their facilities underutilized (Corbett, 1996).

The competition for traffic leads ports to invest in greater capacity even if there is already sufficient capacity at a nearby port that serves the same geographic market. As an example, the ports of Charleston, Brunswick and Jacksonville are each located in a different state, but in close proximity and serve the same market¹. These ports have been competing for new car import business since the 1980's. BMW moved their Southeast

¹ The Port of Brunswick, Georgia, is located between the ports at Jacksonville, Florida, and Charleston, South Carolina, which are approximately 250 miles apart via I-95.

import hub from the Port of Jacksonville to the Port of Brunswick in 1987, citing industrial pollution as one of their reasons for the move (Associated Press, 1987; Hayes, 1988). The new auto facility developed by the Georgia Ports Authority at the Port of Brunswick offered a cleaner environment and less traffic congestion than Jacksonville. After constructing a 25-acre import processing facility at Brunswick's auto facility, BMW later moved their import operations to the Port of Charleston in 1993. In 2008, BMW announced plans to return imports bound for the Southeast to the Port of Brunswick, where infrastructure investment was expanding capacity at the auto facility (Bird, 2009). This example illustrates the competitive environment among port facilities in the US that may result in the misallocation of public resources rather than the efficiency typically associated with a competitive environment (Farrell, 1996).

While this competition may bring jobs and income to the community that is receiving a boost in port activity, to the extent that these jobs are met with losses in the sending community this is not really job *creation* but job *transfer* from one state to another. Only to the extent that investment in port facilities allows a port to process a growth in demand for cargo processing should this investment be associated with job creation and economic development.

Measuring the Economic Impact of Port Activity

The current standard for determining the economic impact of port activity on the national, state or local level is the Port Economic Impact Kit developed by the Maritime Administration (MARAD) of the US Department of Transportation (Connecticut Center for Economic Analysis 2001; Klaers, Powers and Assoc, 2002; Martin and Associates 2005). Available since 2000, the current version of the MARAD Port Kit is a self-

contained, PC-based model that was developed to help U.S. deep-draft ports and other organizations explain the value of the port industry and port facility investments to their communities (MARAD, 2010).

The MARAD Port Kit uses input-output analysis to model the impact of maritime operations in container, liquid and dry bulk, breakbulk, auto transport, cruise, project cargo, and passenger ferry operations. The kit considers all activities directly needed to handle each specific movement. Maritime construction and dredging are also included in the model. Because the MARAD port kit only measures the direct impact of port activity on the economy, analyses of the economic impact of ports also use the Regional Input-output Modeling System (RIMS), REMI or IMPLAN modeling packages to estimate the indirect and induced effects of port activity. All are widely accepted software packages for performing economic impact analysis.

Input-output modeling tracks the impact of cargo handled by a port by tracking the direct, indirect and induced impacts of port activity on the local economy. Direct impacts include direct spending by the port industry and direct spending by port users. Indirect and induced effects come from spending that occurs as the direct expenditures of the port industry and port users are re-spent throughout the economy (Humphreys, 2007). In this way, the effect of port activity is measured by estimating its impact on employment, income (earnings), output and gross state product as activity at the port generates additional economic transactions in the firms that use or support the port.

An economic impact analysis for Georgia's deepwater ports in Brunswick and Savannah was completed for 2006 by the Selig Center at the University of Georgia using the MARAD port impact kit and IMPLAN (Humphreys, 2007). Data estimates from this

analysis are used herein to estimate the economic impact of new cargo volumes processed through the Port of Brunswick that were enabled by a series of infrastructure investments at the port.

In order to claim that the infrastructure projects resulted in economic development for Georgia by increasing cargo volumes at the port, we must address the ‘but for’ question. In this case the ‘but for’ takes two forms: the Port of Brunswick would not have realized the increased cargo volumes ‘but for’ the infrastructure projects, and the State of Georgia would not have the jobs, income, output and GSP impacts associated with its ports ‘but for’ the existence of those ports within state boundaries.

It is clear that the Port of Brunswick would not have achieved the new cargo volumes but for the infrastructure improvements. The infrastructure improvements overcame physical obstacles preventing growth by deepening the port to allow larger ship access and by improving rail and road access to the port to enable larger cargo volumes to enter and exit the port each day². It is not, however, as straightforward to claim that the jobs and other economic impacts that are associated with the port would not be located in Georgia but for the existence of the port. With technology and transportation allowing a port to service a wide area, would Georgia businesses not be able to rely on ports in adjacent states to take care of their transportation needs? The answer to this question lies in the methodology behind the existing data generated by the Selig Center used in this analysis.

² See Chapters 3 and 4 for a detailed description of the infrastructure improvements and associated cargo volume increases.

To address this issue, the Selig Center study used a survey of the entire population of users of the Georgia port facilities conducted in 2003 to identify the industries using the port and the extent to which they rely on Georgia's ports (Humphries and Bart, 2004). All of the economic activity generated by port users whose decision to locate in Georgia hinges on the presence of these ports can be counted as direct economic impact, while a fraction of the economic activity of those businesses that only partially rely on the presence of Georgia's ports are counted as direct economic impact (Humphries 2007, pp 7-10). While it is impossible to accurately determine exactly how much of Georgia's economic activity is directly attributable to its ports, the data used herein makes a reasonable effort to discern what economic activity is and is not generated 'but for' Georgia's ports.

CHAPTER 2

THE PORT OF BRUNSWICK

The Brunswick Port Authority was absorbed into the Georgia Ports Authority shortly after WWII. The Georgia Ports Authority is a quasi-state agency with a thirteen-member Board of Directors appointed by the Governor of Georgia from the state at large. The Georgia Ports Authority manages the four ports within the state; the two ocean ports, Brunswick and Savannah, and two river ports in Bainbridge and Columbus.

Industries at the Port of Brunswick

Brunswick specializes in three types of cargo: Break bulk, dry bulk and ro/ro. Located in downtown Brunswick, the Mayor's Point terminal handles the break bulk cargo which is made up of paper product exports from the regional forest industry. The dry bulk and ro/ro facilities are located on a part of the Port of Brunswick called Colonel's Island. The bulk facility, often referred to as the Agribulk facility, handles agricultural bulk mainly for export including wheat, corn and soybeans. Brunswick's ro/ro facility was developed mainly for new car imports, and as such is usually referred to as the auto facility. Table 1 shows the volume of cargo processed in each of these facilities since 1998. Since development of the ro/ro facility in 1986, Brunswick has risen to be a major car port, and is currently the 6th largest car port in the US in terms of units of cars (Georgia Ports Authority, 2008b). Further analysis of growth and decline in each industry is included in the final sections of this report.

With international trade growing rapidly and containerization dominating traffic at large regional ports such as Savannah and Jacksonville, the Georgia Ports Authority

built two new cargo facilities on Colonel's Island, a GPA-owned 1300 acre property across the channel from Mayor's Point. The auto port, built in 1986, was developed in response to congestion at the Port of Jacksonville, which had the largest auto facility in the Southeast. The grain facility was built on Colonel's Island when a similar facility in Savannah was removed to make way for expansion of the container terminal.

The auto port was developed to attract foreign car makers who were frustrated with congested, older facilities at established auto ports in the region. In the new car supply chain, car imports are finished by auto processors located at the port of entry. This includes fitting audio systems and other options, as well as cleaning and preparing the cars for shipment to dealerships. Because new cars are prepared for the final market at the port, environmental concerns such as dust or pollution are as much a concern as available space (Hayes, 1988).

At the time that the auto facility was developed at the Port of Brunswick, the Port of Jacksonville was one of the largest auto ports in the US, but had limited space for expansion to accommodate imports for the growing foreign car industry. A paper mill adjacent to the car storage facilities in the Port of Jacksonville also caused auto importers problems with damaged finishes due to pollution. When the auto port at Brunswick opened for business, the first customer was Yugo, who was newly importing cars to the Southeast. After the industry saw that the auto facility at Brunswick was operational, several major brands followed shortly thereafter, including BMW, Mitsubishi and Mazda who all moved import operations from Jacksonville to Brunswick in 1987. The majority of Brunswick's subsequent car volume came from businesses that moved import

operations from Jacksonville, citing the availability of space, lack of congestion and clean environment that was unique to ports on the east coast (Hayes, 1988; Hagy, 1988).

The grain facility was developed at the Port of Brunswick in 1996 as a result of increasing container traffic at the Port of Savannah. The grain facility was built in Brunswick to replace a similar facility in Savannah which was removed to accommodate additional container berths (R. Abner, Agribulk terminal manager, personal communication, June 24, 2008). The grain facility has seen consistent growth since 1998, fueled by world grain markets and dedicated management at the Port of Brunswick to make the grain facility as modern and efficient as possible.

Table 1: Port of Brunswick Cargo Volume History³

Cargo	FY 1998	FY 2007	FY 2008	1 yr Growth	10 yr Growth
Auto	163,726 units	373,708 units	368,350 units	-1%	125%
Grain	280,052 tons	438,843 tons	814,223 tons	86%	191%
Breakbulk	522,663 tons	172,291 tons	126,794 tons	-26%	-76%

The Ports Impact on Georgia's Economy

In Georgia, the two deepwater ports of Savannah and Brunswick impact the economies of all communities in the state by supporting manufacturing exports, import/export businesses, and industries that support port-related commerce. Port

³ Georgia Ports Authority (2008b).

activity impacts Georgia's economy as the port and port-related businesses engage in economic activity throughout the state as a result of cargo that is shipped through the Georgia port facilities in Brunswick and Savannah. The majority of the impact comes from port users – businesses such as manufacturers or import/export firms that use the port to access goods or ship their goods to market. Port users are distributed throughout the state.

In fiscal year 2007, Georgia's two sea ports processed approximately \$15.5 billion in cargo that was either destined for or originated in communities throughout the state. To illustrate the distribution, Figure 1 shows the approximate value of cargo that traveled to or from each region in Georgia. Regions are defined by regional development centers. Coastal Georgia is a leading beneficiary of port activity, receiving approximately \$4.5 billion in cargo value. However, the Atlanta Regional Commission sees more import/export activity than any other region in Georgia at \$5.7 billion. Following Coastal Georgia and the Atlanta area are the Georgia Mountains at \$1.3 billion and the Central Savannah River Area at just over \$1 billion.

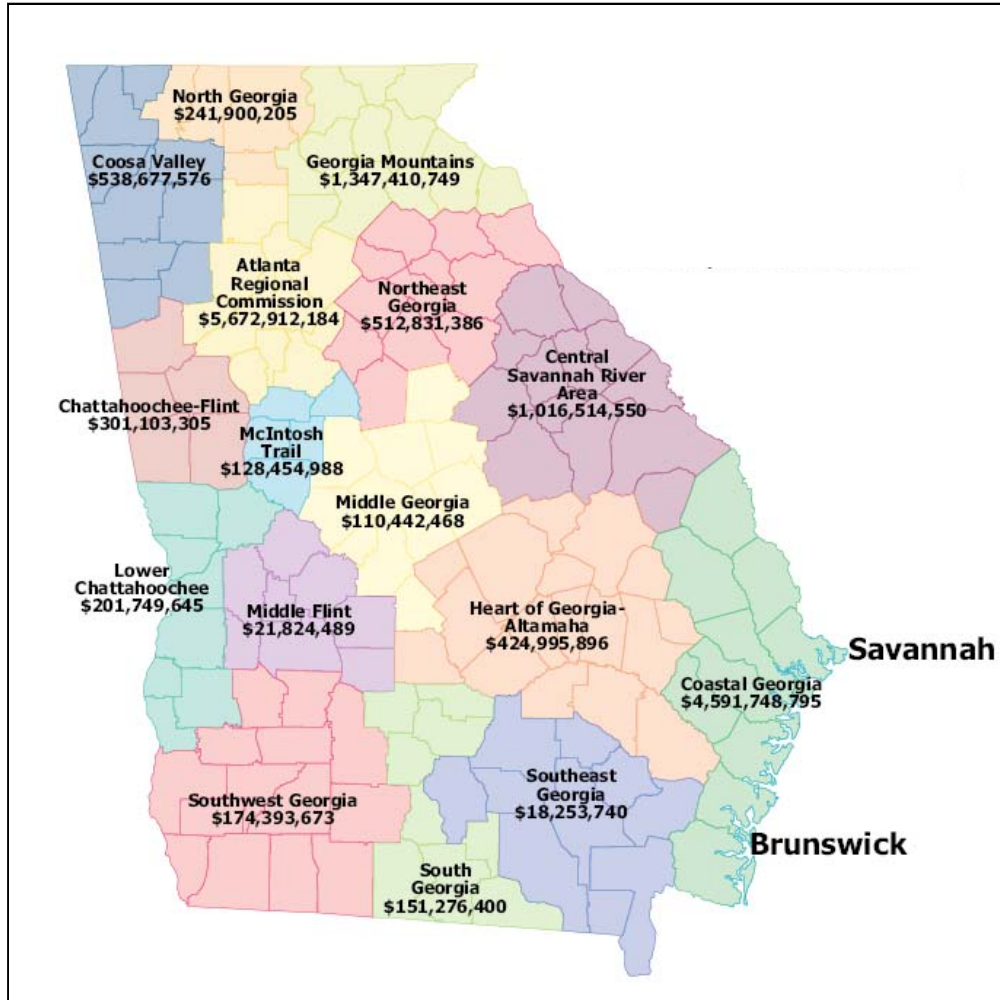


Figure 1: Estimated Cargo Values via Georgia's Deepwater Ports in FY 2007

CHAPTER 3

INFRASTRUCTURE IMPROVEMENTS AT THE PORT OF BRUNSWICK

To accommodate increasing traffic, ports adapt by increasing the size of their operations and by increasing the efficiency of their existing space. In response to increasing ship size and cargo volume, between 1999 and 2007 the Georgia Ports Authority completed a set of infrastructure projects designed to increase capacity at the Port of Brunswick. These projects allow the Port of Brunswick to accommodate larger ships through harbor and loading basin deepening projects, and improved intermodal transfer operations with road and rail improvement projects. This section identifies what infrastructure projects were completed at the Port of Brunswick and how these projects affect operations at the port facility. Unless otherwise cited, information regarding the nature of the infrastructure improvements and their impact on the port's operations comes from personal interviews with the general manager of the Port of Brunswick, Bill Dawson, and the terminal manager of the agribulk facility, Ronnie Abner.

The infrastructure projects undertaken at the Port of Brunswick are:

- harbor and channel deepening to 36 feet mean low water (mlw)
- replacement of the old Sidney Lanier lift bridge with fixed span bridge
- dredging loading basins
- expanded rail capacity and new direct rail connections
- construction of an overpass on US Highway 17

Table 2 shows the approximate investment and funding source for each infrastructure project as well as the time frame in which each was completed.

Table 2: Summary of Infrastructure Projects

Infrastructure Project	Cost	Funding	Completed
Harbor Dredging	\$100 million	Federal and State	2007 (Summer)
E. River Dredging	\$1 million	GA Ports Authority	2007 (Spring)
Expanded Sydney Lanier Bridge	\$100 million	GA DOT	2003 (Spring)
Hwy 17 Overpass	\$7 million	Federal and State DOT	2007 (Spring)
Overton Junction	\$4 million	GA DOT	2006 (Fall)
Anguilla Junction connector	\$4.5 million	GA DOT	2007 (Spring)

Dredging the harbor and channel to increase the draft from 30 to 36 feet mlw allows the Port of Brunswick to accommodate Panamax class vessels, the largest ship that can pass through the Panama Canal. Panamax vessels require a draft of 40 feet. A depth of 36 feet mlw means the port can accept Panamax vessels at high tide.

During the ongoing feasibility study on the Port of Brunswick, the Corps of Engineers determined in 1990 that the existing Sidney Lanier Bridge, a narrow lift bridge over the southern end of the Brunswick River through which all approaching ships passed, was too narrow to structurally withstand dredging. The Georgia Department of Transportation agreed to fund a new bridge to replace the old lift bridge. With the new Sidney Lanier fixed span bridge underway, Congress authorized the deepening project in 1999.

Replacing the Sidney Lanier Bridge with a wide, fixed span bridge also eliminated the possibility of large ships striking the old lift bridge. Ships had to “thread the needle” when passing through the lift of the old bridge, and on two occasions in its history the bridge was struck. The new bridge has an air draft of 185 feet mlw and width of 500 feet, making an unrestricted passageway for all ships.

In addition to deepening the harbor and channels, loading basins at both the Colonel’s Island terminal on the Brunswick River and the Mayor’s Point terminal on the East River were dredged to 40 ft. A loading basin is an area alongside a terminal’s berths that is dredged in order to ensure adequate clearance under a ship as it is loaded with cargo. Maintaining deep clearance under ships in the terminal allows large vessels with a draft of more than 36 feet to sail in and out of the harbor at high tide, but be fully loaded while in the terminal regardless of tidal changes.

To be competitive, a port must be able not only to accommodate larger ships, but also have quick access to intermodal transportation to deliver cargo from incoming ships to the market or to deliver goods to the ship for export. Two rail infrastructure projects were completed as part of the Port of Brunswick infrastructure update: the construction of the Overton Junction rail connection on the west side of the port, and the expansion of the existing Anguilla Junction north of the port.

Trains coming into the agribulk and auto facilities on Colonel’s Island from the west use Norfolk Southern rail service, which had no direct access into these port facilities. Trains bound for the agribulk and auto facilities used a small access line that could not accommodate a full train, so trains were broken down to individual cars, routed to Colonel’s Island, and reassembled once at the port. This inefficient system affected the

port's customer relationship with Mercedes, which used Norfolk Southern trains to ship SUVs to Brunswick for export. Before the Overton rail junction was completed, trains from Mercedes plant in Vance, Alabama, took 3 – 5 days in route to Colonel's Island. With the addition of the Overton Junction, Norfolk Southern trains have a direct line into Colonel's Island, reducing transit time from the Mercedes plant to 24 hours.

The final infrastructure project undertaken at the Port of Brunswick was the construction of an overpass on Highway 17 where the highway separates the existing facilities on Colonel's Island from 900 acres of adjacent GPA-owned property. Creating an overpass allows expansion of auto processing and storage facilities by eliminating an at-grade crossing whereby new car shipments were shuttled through local traffic across highway 17 to newer storage facilities on the south side of the island. A small amount of auto storage already exists south of Highway 17, but crossing the local highway with new car shipments meant holding up local traffic (which included cargo trucks bound for port facilities) and risking damage to new car cargo by driving on public streets. The grade separation allows local traffic to pass unhindered while new car shipments are transported freely under Highway 17 to existing and future storage and processing facilities.

CHAPTER 4

FINDINGS: THE IMPACT OF INFRASTRUCTURE PROJECTS

Operational Impact

In order to consider the potential economic development impacts of these infrastructure projects, it is necessary to first determine the impact these projects have had on cargo volumes processed by the Port of Brunswick. Several factors confound such an analysis. First, there are many factors that can affect port cargo volumes from one year to the next unrelated to the completion of capacity-enhancing infrastructure projects. Global business cycles, seasonal demands, commodity prices and natural disasters can all affect demand for cargo shipments through a port (Helling and Poister 2000). For this reason, simply taking the change in volume in the year (or even five years) after the completion of the infrastructure projects is not a realistic measure of their impact on cargo volumes.

Furthermore, the impact of infrastructure improvements on cargo volume at the port may not occur for a number of years as the increase in capacity slowly attracts new shipping contracts. Fiscal year 2008 was the first full year in which all infrastructure projects were complete. This analysis uses cargo volume data for the Port of Brunswick for FY 2008 and interviews with the general manager and the agribulk terminal manager at the Port of Brunswick to approximate the increase in cargo volume that can be attributed to the infrastructure investment in the first years following completion of the projects. Table 3 summarizes the operational impact of the infrastructure projects on each of the Port of Brunswick's cargo facilities.

Auto

The automobile industry on Colonel's Island realized immediate benefits from the infrastructure projects. The completion of Overton Junction on the Norfolk Southern (NS) line reduced time-in-transit for trains to and from the Mercedes Benz plant in Vance, Alabama by more than half. As a result, trains carrying Mercedes sport utility vehicles for export through the Port of Brunswick spend 24 hours in transit to Colonel's Island, 24 hours in the terminal for unloading, and 24 hours in transit to return to the Mercedes plant in Alabama for reloading. This allows a schedule of 3 60-railcar "hot" trains a week to come into Colonel's island with SUVs for export. This improvement increased the volume of cars processed through Brunswick by 98,000 cars in FY 2008 that would not have gone through the Port of Brunswick but for the infrastructure improvements (B. Dawson, personal communication, June 24, 2008). The increase in volume comes from vehicles that Mercedes was shipping out of the Jacksonville auto facility and an increase in production at the Alabama plant for export to Europe.

The smaller scale project of the Hwy 17 overpass completed on Colonel's Island in spring of 2007 has a large potential impact on the auto operations by opening up 900 additional acres for development. Hwy 17 bisects Colonel's Island into two halves, the north side where the three deepwater berths of the auto and grain facilities operate on 390 developed acres, and the south side of the island where the Georgia Ports Authority owns 900 additional undeveloped acres of property. The overpass allows an access road to connect the two halves and allows for direct, more efficient and safe transit of cargo from storage on the south side to the north. This undeveloped land is slated for the automotive industry to expand its operations on Colonel's Island. With 360 acres of paved auto

storage available in 2008, the 900 additional acres represent a great capacity for expansion and increased volume.

To take advantage of this available space, the harbor deepening and construction of the new Sidney Lanier Bridge allow bigger vessels to reach Colonel's Island and greater volumes of cars to transit the facility. At a new mean low water depth draft of 36 feet, Colonel's Island is now open to all Ro/Ro vessels in service in 2008. In March, 2008, approximately one year after the deepening was completed, the Morning Caroline, the largest class of Ro/Ro vessels in service capable of carrying 6,000 vehicles, made her maiden voyage from Osaka, Japan, to Brunswick (Georgia Ports Authority, 2008a).

The lower slot costs and delivered prices that are realized through the economies of scale of using larger vessels combined with the available land for expansion and improved rail transport position Brunswick as a competitive option for auto imports for regional distribution to the Southeast and potentially the Midwest. As a result of this available space and the other improvements at the auto port, in 2007 Mercedes Benz USA announced plans to move their Southeast Import Center from a facility at the Port of Jacksonville to a new facility at the Port of Brunswick (Quesada, 2007). The facility opened in January 2010 and is expected to bring an additional 50,000 vehicles through Brunswick's auto port for distribution through the southeast, Texas and Oklahoma (Georgia Ports Authority, 2010). When combined with the additional 98,000 Mercedes Brunswick is processing as a result of the rail infrastructure improvements, total new volume at the auto facility resulting from the infrastructure improvements is 148,000 auto units.

AgriBulk

The agribulk facility on Colonel's Island has also seen increased throughput volume as a result of the infrastructure expansion projects. Because of the increased capacity at the agribulk facility, the Port of Brunswick signed a contract with Bunge North America to ship at least 500,000 tons annually through Brunswick's agribulk facility (R. Abner, personal communication, June 24, 2008). In FY 2008, the first full year of operation with all new infrastructures in place, the Port of Brunswick's agribulk facility processed 814,223 tons, an increase of 375,380 tons over the previous year (Georgia Ports Authority, 2008b).

The increase in volume already seen at the Port of Brunswick's agribulk facility is a direct result of the Bunge agreement and the increased efficiency realized by access to larger bulk vessels and improved rail access for speedier movement of grain shipments into the port. The contract with Bunge was in place for the last 8 months of FY 2008, so the full impact of the contract had not been measured at the time the managers of the agribulk facility were interviewed. For this reason, the impact of the infrastructure improvements on volume at the agribulk facility is considered to be 500,000 short tons, as that is the minimum guaranteed by the Bunge agreement, all of which represents new volume to the port.

The harbor deepening and bridge expansion projects opened the harbor up to a depth of 36 feet mlw and opened the agribulk facility up to an additional 45% of the world's bulk vessels. While some vessels in the world fleet would still be restricted from calling on Brunswick, Panamax class bulk vessels require a draft of 39 – 42 feet. Panamax vessels could not previously call on Brunswick, but the harbor deepening project allows these vessels to call on Brunswick with the tide.

The capacity to handle larger ships of Panamax class is necessary for the port to be competitive on long-distance routes. With the growing economies in Asia importing more wheat and other agricultural products at increasing rates, opening the port of Brunswick to Panamax bulk vessels allows new routes to this growing market, securing markets for Georgia's agricultural products as well as a competitive place for Brunswick in worldwide grain distribution.

Break Bulk

The break bulk facility on Mayor's Point has a long history exporting forest products from Georgia and the Southeast. Built in the 1950's to prevent the port from closing after WWII, the Mayor's Point terminal has provided consistent revenue for the Georgia Ports Authority in Brunswick and a consistent market for the region's pulp and paper industry. In recent decades, the growth in vessel size and demand outpaced Brunswick's depth restriction. At the time the deepening project began in 2002, the ships calling on the break bulk terminal already exceeded mean low water. Brunswick was able to accommodate these vessels by timing their calls with high tides, but was still prevented from fully loading the ships because of depth restrictions in the channel and loading basins.

Star Shipping, of Bergen, Norway, is the long-standing and sole shipping service calling on Brunswick's break bulk terminal. Star Shipping's route that calls on Brunswick initiates its circuit in the UK, and then calls on Houston, Brunswick, Wilmington and Charleston before delivering the acquired cargo to Rotterdam in the Netherlands. In recent years, the size of ships and the capacity of other ports on the circuit outpaced Brunswick's. As ships became larger and could be heavily loaded with

cargo in Houston, the vessels would be low in the water upon arrival at Brunswick. With the mean low water restrictions and shallow loading basin at the Port of Brunswick's breakbulk facility, this often meant the ship could not load as much cargo in Brunswick as desired. As a result, cargo volumes through Mayor's Point have steadily declined over the last 10 years (see Table 1).

With the pace of the dredging project proceeding slowly, Star considered dropping Brunswick from their service. To secure the service into Brunswick, the Georgia Ports Authority funded a \$1 million project to dredge the channel and loading basing at the Mayor's Point breakbulk facility ahead of the proposed project by the Army Corps of Engineers so ships could take on more cargo even while the harbor deepening was ongoing. With the completion of all deepening projects, larger vessels can call on Brunswick and accept full loads.

Table 3. Operational Impact of Infrastructure Projects

Infrastructure Project	Operational Impact		
	Auto	Agribulk	Breakbulk
Harbor, channel and basin deepening	Opens facility to all ro/ro vessels in service	Opens facility to 45% of world's bulk vessels	Facility can fully load the vessels of existing client
Expanded Sydney Lanier Bridge	Enabled deepening; ease of passage for large vessels	Enabled deepening; ease of passage for large vessels	Enabled deepening; ease of passage for large vessels
Hwy 17 Overpass	Opens 900 acres for future auto facility expansion	n/a	n/a
Overton Junction	Expedited rail access to facility; faster cargo processing	n/a	n/a
Anguilla Junction connector	Doubles rail capacity; faster cargo processing	Doubles rail capacity; faster cargo processing	n/a

Economic Impact

The new business realized at the Port of Brunswick through infrastructure improvements does not just represent increased revenue for the port itself, but has economic development implications throughout the state as the port industry and port users engage in economic activity as a result of the additional cargo volumes processed at the Port of Brunswick. The total economic impact of port activity on Georgia's economy occurs through "direct spending by the port industry, direct spending by port users and indirect or induced spending that occurs as the direct expenditures of the port industry and port users are re-spent" (Humphreys, 2007, p. 6).

To determine the economic impact of the aforementioned infrastructure improvements on Georgia's economy, data from a study by the Selig Center at the University of Georgia is used. This study determined the economic impact of Georgia's deepwater ports on Georgia's economy in fiscal year 2006 by tying the volume and type of cargo shipped in or out of Georgia's two deepwater ports to economic activity in the state of Georgia (Humphreys, 2007). The data from this study permits an analysis of the impact that the new throughput associated with infrastructure improvements at the Port of Brunswick has on Georgia's employment, incomes, gross state product and total output.

To calculate the economic impact of the Port of Brunswick's infrastructure improvements, only that volume that could be directly attributed to the infrastructure projects was used. The volume increases at both the auto and grain facilities are used to determine the economic impact of the infrastructure improvements on Georgia's economy because these are measurable increases in volume directly attributable to the infrastructure improvements. Volume at the Mayor's Point facility is not included

because no increase in volume as a result of the infrastructure improvements can be determined. In theory, since the infrastructure improvements prevented the sole shipping company currently calling on Brunswick's break-bulk facility from leaving, *all* volume at the break bulk facility could be considered an impact of the infrastructure improvement projects. However, since this represents existing business (and therefore existing impact on the economy), it is not included in this analysis.

The infrastructure improvements undertaken at the Port of Brunswick were determined to have direct impacts on the automobile cargo and dry-bulk cargo operations at the port in the form of increased cargo volumes (see Table 3, above). Using the Selig Center's findings, the impact on output, GSP, income and employment of each unit of dry-bulk and automobile cargo was determined. For example, 376,051⁴ units of auto/vehicle cargo went through Georgia port facilities in Brunswick and Savannah in FY 2006, and the Selig Center reports that this volume produced \$94,167,400⁵ in total output in the state through direct and indirect/induced effects. This produces a per-unit impact of \$250 of output in the state of Georgia for each vehicle processed through a port facility. Thus, the additional 148,000 auto/vehicle units of throughput that can be contributed to the infrastructure improvements would produce an additional \$37,060,864 in output.

Tables 4 and 5, below, use this methodology to calculate the impact of each infrastructure improvement project in the areas of output, employment, income and gross

⁴ See Table 1 in Humphreys (2007)

⁵ See Table A-4 in Humphreys (2007)

state product based on the new volume at the auto and agribulk facilities that can be attributed to the infrastructure projects. The direct and indirect impacts are reported separately so it is clear how much economic impact comes from economic activity directly attributed to the handling of the additional automobile and grain cargo at the port facility and throughout the state, and that economic impact that results from indirect and induced responding.

Auto

This investigation determined that the completion of the infrastructure projects at the Port of Brunswick is associated with 148,000 additional units of auto cargo processed through the port since the end of fiscal year 2007. Using existing data on the impact of auto cargo on Georgia's economy produced by the Selig Center at the University of Georgia, the effect on employment, income, GSP and output in the state of Georgia associated with this increase in volume is as follows: A direct effect of 214 jobs, \$7.7 million in income, \$11.8 million in GSP and \$24.1 million in output. Indirect and induced effects further support approximately 122 jobs, \$4.2 million in income, \$6.4 million in GSP and \$13 million in output.

Table 4. The Economic Impact of New Auto Cargo Volume in 2006 dollars

		Total Economic Impact (\$1000's)			
		Employment	Income	GSP	Output
	Direct	543	\$19,750.4	\$30,085.8	\$61,199.2
	Indirect & Induced	311	\$10,790.6	\$16,313.0	\$32,968.2
		Economic Impact per Unit			
Total volume		Employment	Income	GSP	Output
376051	Direct	0.001	\$52.5	\$80.0	\$162.7
	Indirect & Induced	0.001	\$28.7	\$43.4	\$87.7
		Economic Impact of New Volume (\$1000's)			
New volume		Employment	Income	GSP	Output
148,000	Direct	214	\$7,773.0	\$11,840.7	\$24,085.8
	Indirect & Induced	122	\$4,246.8	\$6,420.2	\$12,975.1

Agribulk

The completion of the infrastructure projects is associated with an increase of 500,000 short tons of throughput annually at Brunswick's agribulk facility. Using existing data on the impact of bulk cargo on Georgia's economy produced by the Selig Center at the University of Georgia, the effect on employment, income, GSP and output in the state of Georgia associated with this increase in volume is as follows: A direct effect of 67 jobs, \$2.6 million in income, \$3.8 million in GSP and \$8.6 million in output. Indirect and induced effects further support approximately 40 jobs, \$1.4 million in income, \$2.1 million in GSP and \$4.4 million in output.

Table 5. The Economic Impact of New Agribulk Cargo Volume in 2006 dollars

		Total Economic Impact (\$1000's)			
		Employment	Income	GSP	Output
	Direct	169	\$6,549.9	\$9,659.1	\$21,906.1
	Indirect & Induced	101	\$3,524.8	\$5,325.2	\$11,081.1
		Economic Impact per Unit			
Total volume		Employment	Income	GSP	Output
1,479,278	Direct	0.000	\$17.4	\$25.7	\$58.3
	Indirect & Induced	0.000	\$9.4	\$14.2	\$29.5
		Economic Impact of New Volume (\$1000's)			
New volume		Employment	Income	GSP	Output
500,000	Direct	67	\$2,577.8	\$3,801.5	\$8,621.4
	Indirect & Induced	40	\$1,387.2	\$2,095.8	\$4,361.1

CHAPTER 5

CONCLUSIONS

This analysis found that the infrastructure improvements completed at the Port of Brunswick are associated with gains in employment, income, GSP and output by enabling an increase in cargo throughput at the auto and agribulk facilities at the port. The increase of 148,000 vehicles and 500,000 short tons of grain annually are associated with a total of 443 jobs, \$16 million in income, \$24.1 million in gross state product, and \$50 million in output throughout the State of Georgia through the direct, indirect and induced effects of processing this cargo through the Port of Brunswick.

The impact on jobs, income, gross state product and output were determined using existing data on the economic impact of Georgia's ports from a 2006 study by the Selig Center at the University of Georgia. This study used the MARAD port economic impact kit and the IMPLAN software to estimate the direct, indirect and induced effects of cargo-based activity at Georgia's ports. This is a typical approach for measuring the economic impact of port operations. The use of IMPLAN and other input-output economic modeling packages is also a standard approach in determining the economic impact of transportation infrastructure projects.

While the use of modeling software allows investigators to use complex economic models to estimate the economic impact of a project, the result is a broad picture of the economic impact across (typically) an entire state. The investigation performed for this thesis went beyond the output of the economic impact models to determine how the infrastructure projects effect the day-to-day operations of the Port of Brunswick, the

tangible increase in volume associated with these projects and exactly where this increase in volume originated.

The findings of 148,000 additional units of auto cargo and 500,000 additional short tons of grain are not permanent increases in volume, and as such the associated impact on Georgia's economy is also not permanent. The impact of the infrastructure projects on Georgia's economy will fluctuate over time as business cycles, shipping trends and competition from other ports affect cargo volume at the Port of Brunswick. What is certain is that the infrastructure improvements have increased capacity at the Port of Brunswick, positioning the port to acquire new cargo volumes - and thus new economic activity - that would not have been possible without the infrastructure improvements.

While the economic impact figures reported herein represent the full impact of the increase in cargo volume at the port by counting the direct, indirect and induced effects on Georgia's economy, it is important to consider the wider economic development implications of these figures. The increase in auto cargo volume at the Port of Brunswick is new economic activity for the State of Georgia, but not new activity to the region. The increase at the auto facility came largely from Mercedes imports and exports that were previously processed through the Port of Jacksonville 70 miles south in Florida. To the extent that this volume increased jobs and economic activity in the State of Georgia, it was likely met with comparable losses in the State of Florida. As a result, the increase in jobs in Georgia was mostly a transfer of jobs across state lines. Only newly generated import or export volume can truly be associated with job creation and new economic development.

While previous studies have found that the economic impact of port activity is widely dispersed, and growing more-so as technological and transportation innovations disperse the economic activity associated with ports, there are still local economic development implications for the community surrounding the port. The relocation of the Mercedes Southeast Import Center to the Port of Brunswick represents direct job growth for the City of Brunswick, although at a fraction of the total jobs impact determined through the MARAD and IMPLAN models. Since the import center was previously located in Jacksonville, Brunswick's gain is Jacksonville's loss. Other firms located in Brunswick as a result of the port include International Auto Processors, Waggoners Trucking, and Jered Fabricators and Assembly. Together these firms employed 371 people in 2009 (Brunswick and Glynn County Development Authority, 2009).

At the heart of this analysis is the question of whether investment in port infrastructure is an efficient use of public funds. Because the decision to invest in ports is made by a state or city ports authority, the lens of decision makers is narrowly focused on accruing benefits to their jurisdiction only. The result is competing expansion among nearby ports and potential overinvestment in port infrastructure at the regional scale. From a regional perspective, port investment is an efficient generator of economic development when it positions the port to accommodate cargo volume that is new to the region, not simply a transfer from another nearby port. Ideal investment in port facilities would be that which focuses on accommodating increasing cargo volume that is generated through increasing international trade and increasing regional consumer demand or production, not cross-border transfers.

A regional approach to port governance and decision-making would reduce interstate competition for cargo volume and increase the efficiency of port investment within the region. While the federal government is prohibited from intervening in state-level port investment decisions through the commerce clause, the U.S. Maritime Administration of the U.S. Department of Transportation is an established policy vehicle that could encourage regional cooperation. The most visible contribution of MARAD to local port administration is the maintenance of the port economic impact kit. A basic internet search on “the economic impact of ports” produces many reports that use this and other economic modeling software packages to estimate the state-wide economic impact of port activity. These reports, commissioned by the local ports authority, seem intended to provide public relations sound bites rather than a thorough understanding of the local and regional impact of port investment. Future efforts of MARAD, and other federal agencies that interact with local ports authorities, should include facilitating regional cooperation among ports authorities and providing tools and research intended to more broadly capture the costs and benefits of port investments.

APPENDIX A

GLOSSARY OF TECHNICAL TERMS

GLOSSARY OF TECHNICAL TERMS

berth: The wharf space at which a ship docks.

breakbulk cargo: Non-containerized general cargo stored in boxes, bales, pallets or other units to be loaded onto or discharged from ships or other forms of transportation. Examples include iron, steel, machinery, linerboard and woodpulp.

bulk cargo: Loose cargo (dry or liquid; e.g., grain, coal and oil) that is loaded (shoveled, scooped, or pumped) in volume directly into a ship's hold.

cargo: The freight (goods, products) carried by a ship, barge, train, truck or plane.

container: A box made of aluminum, steel or fiberglass used to transport cargo by ship, rail, truck or barge. Common dimensions are 20' x 8' x 8' (see TEU).

containerization: The technique of using a container to store, protect and handle cargo while it is in transit. This shipping method has both greatly expedited the speed at which cargo is moved from origin to destination and lowered shipping costs.

Corps of Engineers: This department of the U. S. Army is responsible for flood protection and providing safe navigation channels. The Corps builds and maintains the levees, flood walls and spillways that keep major rivers out of low lying communities. The Corps is vital to keeping navigation channels open by dredging sand, silt and gravel that accumulate on river and harbor bottoms.

draft: The depth of a loaded vessel in the water, measured from the level of the waterline to the lowest point of the hull of the vessel.

dredge: The process of removing sediment from harbor or river bottoms for safety purposes and to allow for deeper vessels.

dry bulk: Minerals or grains such as potash, industrial sands, wheat, soybeans and peanuts stored in loose piles moving without mark or count.

harbor: A port of haven where ships may anchor.

intermodal shipment: When more than one mode of transportation is used to ship cargo from origin to destination, it is called intermodal transportation. Intermodal transportation uses few laborers and speeds up the delivery time.

mean low water (MLW): Lowest average level water reaches on an outgoing tide.

port authority: The agency which administers use of public wharves and port properties.

ro/ro: Short for roll on/roll/off . A ro/ro ship is designed with ramps that can be lowered to the dock so cars, buses, trucks or other vehicles can drive into the belly of the ship, rather than be lifted aboard.

short ton: A short ton equals 2,000. Lifting capacity and cargo measurements are designated in short tons.

terminal: The place where cargo is handled is called a terminal (or a wharf).

REFERENCES

- American Association of Port Authorities (2010). *US Ports Industries*. Retrieved March 20, 2010, from <http://www.aapa-ports.org>.
- Associated Press. (March 27, 1987). BMW shipping move. *New York Times*. Retrieved June 28, 2008, from <http://www.nytimes.com/1987/03/27/business/bmw-shipping-move.html?pagewanted=1>
- Bird, A. (December 18, 2009). Charleston to receive fewer imports. *Post and Courier*. Retrieved March 20, 2010, from <http://www.postandcourier.com/news/2009/dec/18/charleston-to-receive-fewer-imports/>
- Boschken, H. (1998). Global Shift in Container Traffic and its Implications for Economic Development Along the American Land Bridge. *Public Works Management & Policy* 2(4), 368-372.
- Brunswick and Glynn County Development Authority (2009). 15 Largest Companies. Retrieved January 28, 2010 from <http://www.georgiasgoldenopportunity.com/KeyIndustries/images/Largest%2015%20companies%20Feb%202010.pdf>
- Cohen, J. and Monaco, K. (2008). Ports and Highways Infrastructure: An Analysis of Intra- and Interstate Spillovers. *International Regional Science Review*, 31(3), 257-274.
- Connecticut Center for Economic Analysis, Department of Economics, University of Connecticut (2001). The Economic Impact of Connecticut's Deepwater Ports: An IMPLAN and REMI Analysis. Prepared for the Connecticut Coastline Port Authority. Retrieved March 15, 2010, from <http://www.postandcourier.com/news/2009/dec/18/charleston-to-receive-fewer-imports/>
- Corbett, K. S. (1996). Double or nothing: The big stakes of hub ports. *The Journal of Urban Technology*, 3(2), 1-10.
- Crew, J., & Horn, K. (1991). Port Competition for Imported Automobiles: National and Regional Analyses. *Journal of the Transportation Research Forum*, 31(2), 239-252.
- Farrell, C. (1996). The Economic War Among the States: An Overview. The pros and cons of the debate. Retrieved March 17, 2010 from

http://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=3659

Flint, J. (2008, January). Finally, a Break for Detroit. *Ward's Auto World*, 44(1), 64.

Georgia Ports Authority (2007). Annual Report Fiscal Year 2007. Savannah, GA: Georgia Ports Authority.

Georgia Ports Authority (2008a). Maiden Voyages Call on GPA. *Anchorage* 48(2). Savannah, GA: Georgia Ports Authority.

Georgia Ports Authority (2008b). Ports Guide & Directory. Savannah, GA: Georgia Ports Authority.

Georgia Ports Authority (January 11, 2010). Mercedes-Benz USA Opens Vehicle Processing Center at the Port of Brunswick. Retrieved March 12, 2010 from <http://www.gaports.com/corporate/tabid/379/xmmid/1097/xmid/3787/xmview/2/default.aspx>

Hagy, James R. (1988, October). Port of Jacksonville Counts Its Blessings. *Florida Trend*. p 46.

Hall, P. (2004). Mutual Specialization, Seaports and the Geography of Automobile Imports. *Journal of Economic and Social Geography*, 95(2), 135-146.

Hayes, K. (1988, December). Brunswick's Ship Came in. *Georgia Trend*. p. 34.

Helling, A. and Poister, T. (2000). U.S. Maritime Ports: Trends, Policy Implications and Research Needs. *Economic Development Quarterly*, 14(3), 300-315.

Humphreys, J. (2007). The Economic Impact of Georgia's Deepwater Ports on Georgia's Economy in Fiscal Year 2006. Selig Center for Economic Growth, Terry College of Business, university of Georgia. Prepared for the Georgia Ports Authority.

Humphreys, J. and Bart, B. (2004). The Economic Impact of Georgia's Deepwater Ports on Georgia's Economy in FY 2003. Selig Center for Economic Growth, Terry College of Business, University of Georgia. Prepared for the Georgia Ports Authority.

Klaers, Powers and Associates (2002). Port of Duluth-Superior Economic Impact for the 2001 Shipping Season. Prepared for the Duluth Seaway Port Authority. Retrieved March 15, 2010 from <http://www.duluthport.com/dsweconomicimpact2001.html>

Macqueen, J. (2008, February 1). Boxed In. *Lloyd's Shipping Economist*.

MARAD (2010). MARAD Port Economic Impact Kit. Retrieved March 15, 2010 from

<http://www.marad.dot.gov>

Martin and Associates (2005). The 2003 Economic impact of the Port of Seattle. Prepared for the Port of Seattle.

Miller, G. (2007, May 3). US Dry Bulk: Special Report. *Fairplay*. pp. 23-30.

Nodar, J. (2007, October 29). 'Unprecedented' Market. *Traffic World*. p. 33.

Pilsch, M. (2006). Roll-on/Roll-off. *World Wide Shipping*, 69(6), 26-29.

Quesada, T. (May 18, 2007). Mercedes-Benz to move vehicle processing to Brunswick. *Jacksonville Business Journal*. Retrieved February 25, 2010, from <http://jacksonville.bizjournals.com/jacksonville/stories/2007/05/14/daily31.html>

Unknown. (2006). The cream of the crop. *International Bulk Journal*, 1, 31-35.

White, R. (2006, December 22). Small ports also benefit as global trade swells. *The Los Angeles Times*. Retrieved June 11, 2008, from <http://www.portofhueneme.org/documents/Smallportsalsobenefitasglobaltradeswells.pdf>